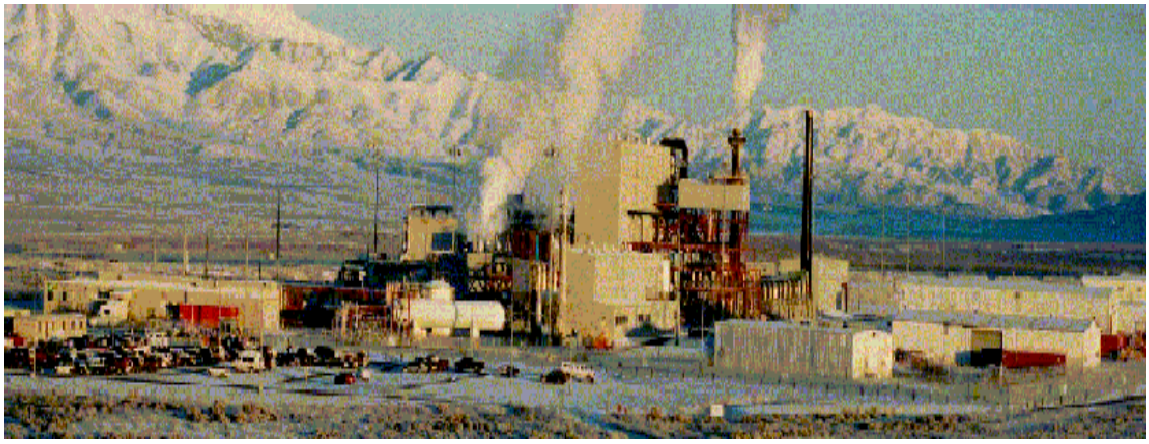
Tooele Chemical Agent Disposal Facility (TOCDF)



Request for a

CLASS 3 MODIFICATION

to the

TOCDF RCRA Permit

Request Number:	TOCDF-Autoclave-03-1008
Request Title:	Autoclave Subpart X Treatment Unit
EPA ID Number:	UT 5210090002

For the:

STATE OF UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

Division of Solid and Hazardous Waste (DSHW)

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1. DESCRIPTION OF CHANGE

OVERVIEW

The TOCDF intends to install and operate an Autoclave for treating the Secondary Waste inventory currently in storage in Area 10 of the Deseret Chemical Depot (DCD). An Autoclave is a sealed vessel into which steam is injected. The elevated pressure at which the Autoclave is operated allows the steam to reach temperatures greater than the 212ºF limit associated with steam that is generated at atmospheric pressure.

The term "secondary waste" is used to describe manufactured articles that became contaminated with chemical agent through their use in the maintenance and demilitarization of the DCD Chemical Munition Stockpile. Examples of secondary waste include wood and plastic packaging material (dunnage), butyl rubber Personal Protective Equipment (PPE), Demilitarization Protective Ensemble (DPE) suits, and spent activated carbon.

Agent-contaminated secondary waste has been generated throughout the process of maintaining and destroying the Chemical Agent Munition Stockpiles stored at DCD. The inventory of agent-contaminated secondary waste was generated primarily during the TOCDF Agent GB and Agent VX Campaigns because at that time (when these campaigns were ongoing and the waste was being generated), there were limited treatment options available.

The Autoclave will be installed in Igloo 1631, which is located in DCD Area 10. This igloo was previously used to sample the DCD Mustard Ton Container (TC) Stockpile. The gloveboxes that were used to sample the TCs have since been removed in anticipation of the Autoclave installation. The entire installation includes:

- One 20-foot-long by 6-foot-diameter, "direct steam," Autoclave; this design allows the steam to contact the waste within the Autoclave.
- One 5.2-million-British-thermal-units (Btu) boiler and associated water treatment system to provide steam to the Autoclave and operate the steam eductor.
- One steam eductor to evacuate the Autoclave to an absolute pressure of approximately ten inches of mercury (inHg). Use of a steam eductor saturates the air stream that is removed from the Autoclave with water.
- One Propylene-glycol-chilled condenser and associated cooling tower used to initially cool the air removed from the Autoclave during the evacuation process steps.
- One refrigerant-cooled condenser used to further cool the air stream removed from the Autoclave. Both condensers are used to remove the moisture in the air stream

exiting the Autoclave during evacuation process steps. Once the moisture is removed by chilling the air stream, the chilled and dried air stream is directed to an existing activated carbon filter system, which is used to remove any agent vapors prior to the air being released to the environment. The carbon filter system services both the Autoclave operations in Igloo 1631 and the Drum Ventilation System (DVS) operations in Igloo 1632.

- One approximate 300 cubic feet per minute (cfm) blower to provide air flow through the autoclave upon completion of the treatment process. This airflow is to assist in cooling and drying the treated wastes before they are removed from the Autoclave for transfer to an off-site Subtitle C Treatment Storage and Disposal Facility (TSDF).

- One Programmable Logic Controller (PLC) used to automate the Autoclave treatment process, evaluate the status, and record selected process parameters throughout the treatment process.

- One 175-gallon surge tank to hold condensate for intermittent transfer to Spent Decontamination Solution (SDS) Tanks.

- Two 1,000-gallon Spent Decontamination Solution Tanks, which will be operated as less than accumulation 90-day storage tanks to collect the condensate generated by the condensers.

Secondary Waste Sorting and Treatment Processes

The secondary waste that was generated during the maintenance of the DCD Chemical Stockpile and TOCDF operations, and placed into permitted storage in Area 10, is intended to be sorted and treated in the Autoclave if necessary.

Containerized secondary waste will initially be moved from its current storage location in Area 10 to Igloo 1633, which was recently permitted as a Container Storage Hazardous Waste Management Unit (HWMU). Igloo 1633 will serve as a staging area to hold drums of secondary waste that are to be sorted, as well as drums that have been sorted and are being staged for Autoclave treatment.

Drums of secondary waste are sorted into two categories of waste at the DVS (see Permit Modification Request TOCDF-DVS-02-1012 titled Area 10 Drum Ventilation System for Secondary Waste). Each drum of waste is placed into the DVS, where the headspace of the drum is monitored for chemical agent using an Automatic Continuous Air Monitoring System (ACAMS). TOCDF will use a criterion of greater-than or equal-to 1.0 Vapor Screening Limit (VSL) to determine those wastes to be processed through the Autoclave.

Figure 1 provides an overview of TOCDF's intended secondary waste management process.

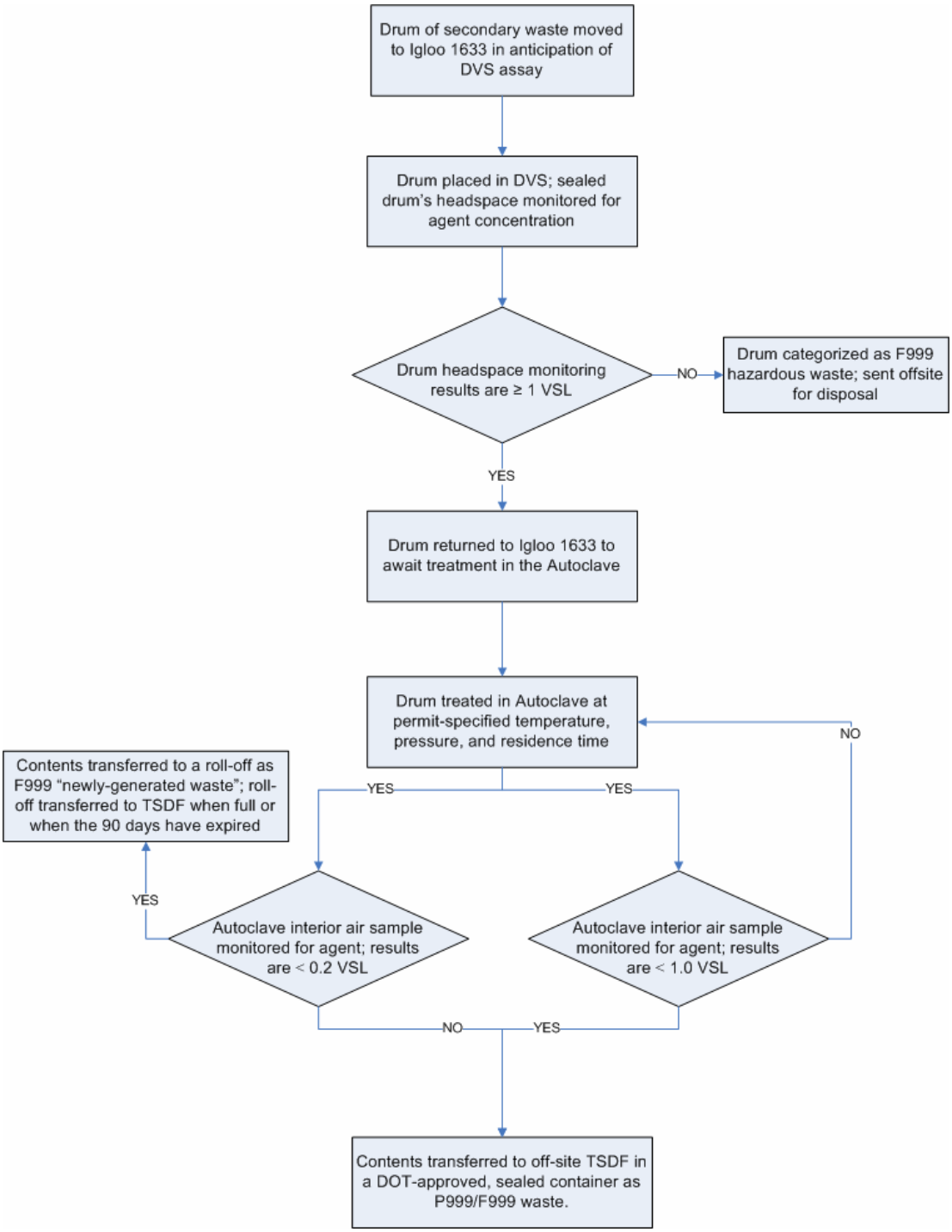

Figure 1. Secondary Waste Management Process

Autoclave Process Description

Drums of secondary waste with ACAMS results of greater than or equal to one VSL will be moved to Igloo 1631 for Autoclave treatment. The wastes are currently planned to be transferred from their original storage container to 64.7-cubic feet (ft^3) waste bins[1]. A liner is placed in each bin before the wastes are transferred into it.

The transfer of wastes from the original storage containers to the waste bins is done using a Crane equipped with a drum dumper. The filling of the waste bins and the opening of the original storage containers occurs near a fume hood, which is located to the side of the junction between the Autoclave vessel and its side-hinged load/unload door. The Autoclave can hold up to four waste bins. Exhaust gas from the fume hood is ducted to the activated carbon filter system that supports both Autoclave and the Drum Ventilation System (DVS) operations occurring concurrently in adjacent Igloo 1632.

A thermocouple lance is inserted into the center of each filled waste bin occupying each of the four possible waste load positions in the Autoclave. These thermocouples will monitor the temperature near the center of the waste's mass throughout the treatment process.

Once loaded, the door to the Autoclave is sealed closed. A steam eductor draws a "hard" vacuum on the Autoclave interior down to approximately ten inHg. The air and volatilized agent drawn from the Autoclave and the eductor steam are mixed at the eductor resulting in a water-saturated gas. This gas passes through two condensers that remove the moisture from the gas steam before the gas exhausts to a carbon filter system. The resulting condensed water is drained to one of two 1,000-gallon Spent Decontamination Solution tanks. The Autoclave is evacuated to allow the steam to more effectively contact the wastes to be treated.

After the Autoclave pressure reaches approximately ten inHg, steam is directed from the boiler to the Autoclave. The Autoclave is a direct-steam design, so the steam injected into the Autoclave contacts the secondary waste material inside (as opposed to an indirect-steam design where the steam passes through tubes that run through the Autoclave). The maximum operating pressure and temperature of the Autoclave is 85 pounds per square inch gauge (psig) and 330 ºF, respectively.

Autoclave operations are controlled by a dedicated Programmable Logic Controller (PLC). The operator can select and control the operating pressure, temperature, and duration of temperature soak. Once the temperature inside the waste bins, as measured by each of the four thermocouple lances reaches the set-point, a timer starts and the temperature and pressure within the Autoclave are maintained for a predetermined period of time. This process step, referred to as the "heat soak", will consist of two phases separated by a mid-treatment evacuation step.

1 Note, this discussion references the use of the Autoclave waste bins, however TOCDF plans to conduct off-site tests using un-contaminated material to determine the effectiveness of treating secondary wastes in their original storage containers. The intended demonstration test will be formatted to use the waste configuration determined most effective in treating secondary wastes.

Autoclave treatment studies conducted by the Department of Homeland Security have shown the decontamination process becomes more effective when the evacuation and heat soak process steps are repeated. TOCDF intends to permit an Autoclave process that will include at a minimum a pre-treatment evacuation step followed by an initial heat soak and then a second mid-treatment evacuation step, followed by a second heat-soak process step.

At the end of each heat soak process step, when the process timer expires, steam is once again directed to the eductor, and the interior of the Autoclave is evacuated to a pressure of approximately ten inHg. This post-treatment evacuation step is intended to dry and cool the treated waste inside the Autoclave. The water vapor removed from the Autoclave is again condensed and directed to one of the Spent Decontamination Solution tanks.

At the end of the final evacuation process step, ambient air is directed though the Autoclave by an approximate 30 horsepower (300 cfm) blower. The purpose of this step is to further cool and dry the treated wastes.

When the drying and cooling process step is complete, the interior of the Autoclave is backfilled with ambient air to a pressure equal to atmospheric pressure. The air within the Autoclave is then monitored for agent concentrations. If the ACAMS results show that no agent is detected above the 0.2 VSL, the treatment of the secondary waste to remove agent contamination is complete, and the treated waste is removed from the Autoclave into the waste bins. The treated wastes are removed from the waste bins and placed in roll-offs for shipment to an off-site Subtitle C TSDF as F999 hazardous wastes.

If the ACAMS results show that Agent detected above 0.2 VSL but less then 1.0 VSL, the treated waste are transferred from the Autoclave to DOT approved containers. The containers are sealed and the waste transferred to an off-site Subtitle C TSDF as F999/P999 hazardous waste with the imposition of special waste handling requirements.

Note that the temperature at which the Autoclave is operated does not result in a reduction in the volume of the waste treated. The Autoclave process is not an incineration process. Therefore, this process does not result in the generation of ash. The polyethylene bags that secondary wastes are packaged in will melt during the first heat soak process step, exposing the wastes inside to the steam. The second mid-treatment evacuation and heat soak process steps further assures effective treatment of the wastes.

In addition, the wastes treated in the Autoclave are classified as hazardous waste only because of the chemical agent contamination. In general, the waste material formulations (e.g., plastic or wood) of the contaminated items do not include chemical compounds that, in and of themselves, would categorize the items as hazardous waste when discarded.

Figure 2 below provides a schematic representation of the Autoclave treatment process.

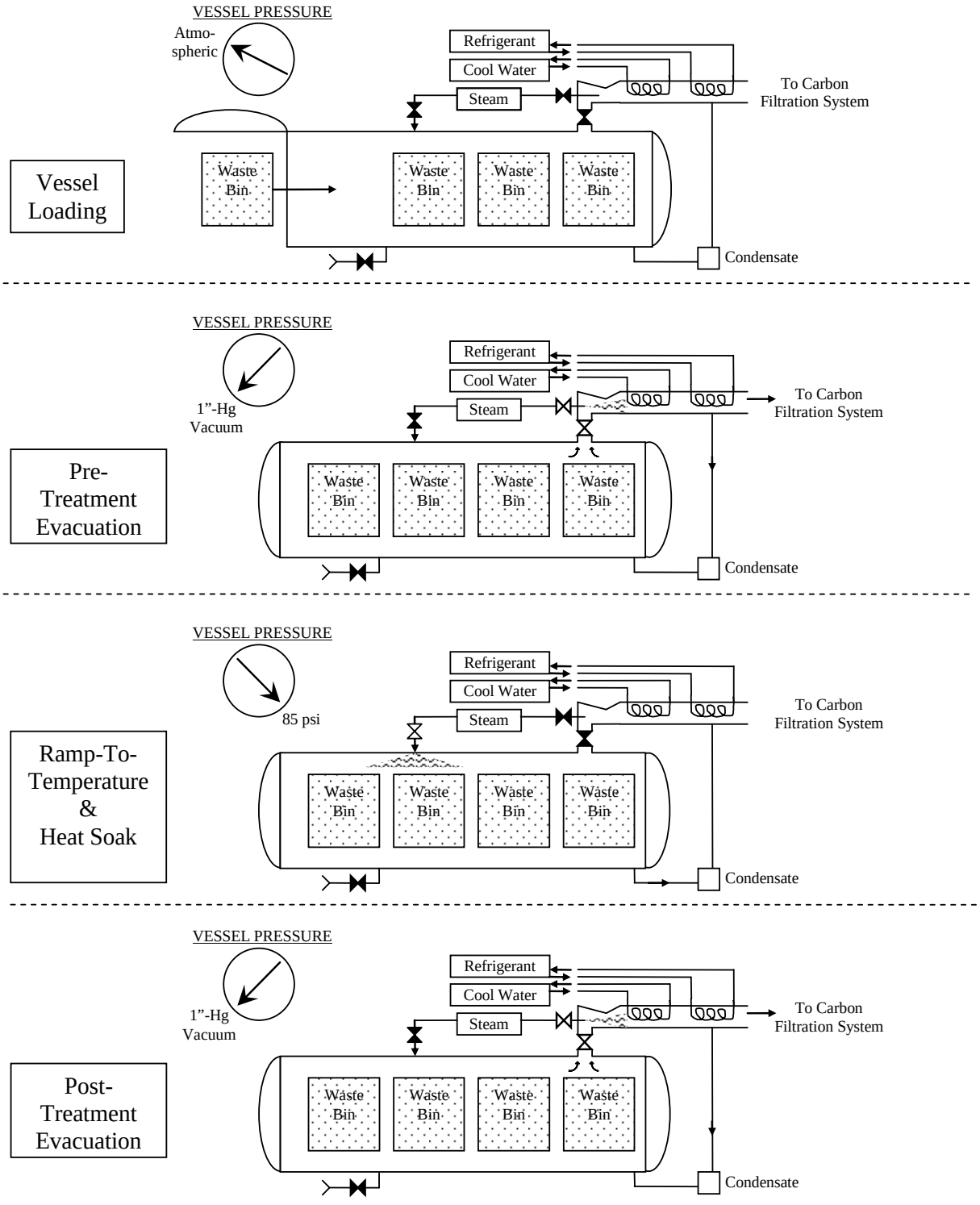

Figure 2. Autoclave Treatment Process

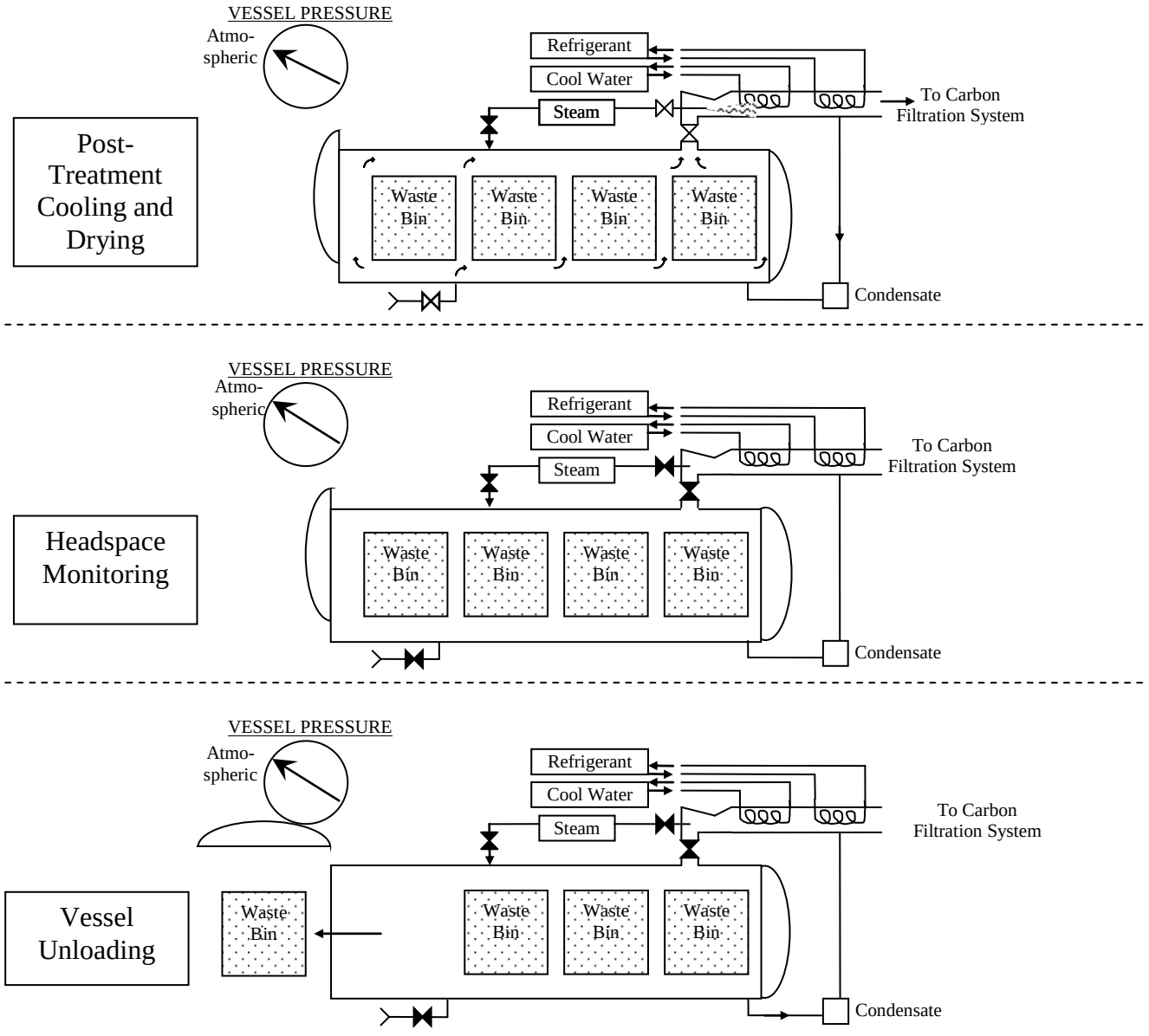

Figure 2 (cont). Autoclave Treatment Process

Autoclave Technology Applied to the Decontamination of Secondary Waste

Autoclave technology was selected as a preferred technology for the decontamination of Secondary Waste based on studies conducted by contractors hired by the United States Army and the fact that all the chemical agents are readily destroyed by hydrolysis. The TOCDF intends to purchase an "off-the-shelf" Autoclave from a manufacturer who supplies autoclaves primarily to the medical waste treatment industry.

Proposed Changes to the TOCDF RCRA Permit

This permit modification request proposes to revise:

- **Module VIII** (Miscellaneous Treatment Units) to include specific conditions for Autoclave operations that ensure removal of the chemical agent that contaminates the articles of secondary waste as determined by execution of a Demonstration Test Plan approved by the State of Utah Division of Solid and Hazardous Waste (DSHW). A proposed test plan can be found in Section 4.1 of this permit modification request. Additionally conditions are included to specify how treated wastes will be managed.

- **Module X** (Air Emission Standards for Equipment Leaks, Tanks, Containers, and the HVAC) to include operating conditions for the carbon filtration system used to control emissions from Autoclave operations.

- **Permit Table 2** to identify the Autoclave as a treatment unit and to identify the types of wastes it will treat.

- **Attachment 1** (Facility Description) to include a reference to Igloo 1631 and the activities that will occur within it (i.e., the treatment of secondary waste using the Autoclave).

- **Attachment 2** (Waste Analysis Plan) to specify Autoclave treatment as the treatment technology based standard for secondary wastes for specific waste matrices.

- **Attachment 4** (Security Procedures) to include a reference to the Igloo 1631 and the activities that will occur within it.

- **Attachment 5** (Inspection Plan) to incorporate the inspection requirements associated with Autoclave operations and the associated carbon filter system.

- **Attachment 6** (Instrument Calibration Plan) to include the process control calibration frequency associate with the Autoclave process control instrumentation.
- **Attachment 8** (Preparedness and Prevention Plan) to describe the hazardous

waste loading activities that will be conducted outside of Igloo 1631. Autoclave treated wastes will be transferred out of Igloo 1631 depending on the post-treatment Autoclave headspace monitoring results.

- **Attachment 9** (Contingency Plan) to specify the emergency generator that provides essential power to Igloo 1631 Autoclave operations. Additionally, a diagram of Igloo 1631 is inserted to depict the location of fire extinguishers and exits.

- **Attachment 10** (Closure Plan) to list Igloo 1631, with the Autoclave and ancillary equipment, as a permitted Hazardous Waste Management Unit (HWMU) requiring final closure.

- **Attachment 14** (Miscellaneous Treatment Units) to include descriptions of Autoclave operations and procedures to prevent releases to the environment from this Subpart X Treatment Unit.

In addition, Attachment 22 (Agent Monitoring Plan) will be revised through a separate permit modification request to identify the ACAMS and DAAMS stations dedicated to Igloo 1631 and Autoclave operations.

Permit Modification Classification

The permitting classification of the Autoclave as a Subpart X Treatment Unit is not explicitly listed in Appendix I of 40 CFR 270.42. Therefore, this permit change is submitted as a Class 3 Permit Modification Request based on 40 CFR 270.42(d)(2)(ii)(B)(d), which reads:

Other modifications. (1) In the case of ***modifications not explicitly listed in appendix I of this section, the permittee may submit a Class 3 modification request to the Agency****, or he or she may request a determination by the Director that the modification should be reviewed and approved as a Class 1 or Class 2 modification. If the permittee requests that the modification be classified as a Class 1 or 2 modification, he or she must provide the Agency with the necessary information to support the requested classification.*

2. JUSTIFICATION FOR CHANGE

Selection of Autoclave Technology for Decontamination of Secondary Waste

The TOCDF is progressing in the destruction of the Chemical Agent Stockpile stored at the DCD. The fate of the secondary waste that was generated as a by-product of the destruction of this stockpile has remained an unresolved issue since the TOCDF was originally permitted for operation in 1996. With no available universal treatment method for the many secondary waste matrices, wastes were placed into on-site hazardous waste permitted storage areas resulting in an ever-increasing inventory currently totaling about 1.5 million pounds.

The TOCDF is currently permitted to treat limited types and amounts of secondary waste in the Metal Part Furnace (MPF). However, MPF secondary waste treatment is not applicable or appropriate to all the secondary waste matrices. Additionally, TOCDF is committed to destroying the inventory of secondary waste generated from TOCDF operations within the same period for destroying the remaining DCD Chemical Agent Stockpile. Because of the size and matrix variety of the secondary waste inventory currently in permitted storage (awaiting a universally applicable treatment method), this commitment cannot be met solely by using the MPF.

Autoclave technology has been selected to treat the majority of the TOCDF agent-contaminated secondary wastes because:

- Tests conducted at Southwest Research Institute® (SwRI®) using a small autoclave and secondary waste matrices spiked with Agent VX demonstrated that this technology can reduce the agent contamination on secondary waste items to levels safe for transfer to off-site Subtitle C TSDFs. A copy of the test report can be found in Section 4.2 of this permit modification request.

- It is the accepted technology for the decontamination of medical wastes. This type of waste is composed of variable matrices, the effective decontamination of which depends on the entire waste load being maintained at a uniform temperature for a pre-specified period of time. The Autoclave that TOCDF intends to purchase is equipped with thermocouple lances that are used to monitor temperature at the center of mass of each waste bin. The pre-programmed time each waste load (i.e., batch of waste) will be exposed to an elevated temperature does not begin until all the temperature monitors throughout the waste load read a temperature equal to the process set-point. The temperature and time the waste matrices are required to be exposed will be based on demonstration test results.

- Agents VX, GB and Mustard (H/HD) are known to be destroyed through hydrolysis reactions; the rate of reaction increases with increased temperatures. The Autoclave TOCDF intends to purchase is designed such that the steam providing the heat also

directly contacts the waste. The multiple evacuation/heat soak process steps make it possible for the steam entering the Autoclave to diffuse through the entire volume of the waste being treated, thus ensuring hydrolysis of any chemical agent present.

- It is capable of treating a broad range of secondary waste matrices. During the Autoclave Demonstration Test (ADT), TOCDF intends to demonstrate the ability of the Autoclave to remove and destroy the residual agent contaminating secondary waste.

- It has high throughput rates relative to the MPF; the Autoclave being purchased by TOCDF has the capability to hold up to four 484-gallon (64.7 cubic feet) waste bins. Maximum waste loads (i.e., batch sizes) are intended to be established through the results of the planned demonstration test.

The above provides the specific reasons for selecting Autoclave technology for treating secondary waste. The broader reason for selecting this technology is that TOCDF has committed to perform on-site treatment of secondary wastes from which representative samples of the waste cannot be obtained.

The agent contamination occurring on secondary waste items is typically localized and not homogeneously distributed throughout the waste matrix. This makes it difficult to obtain a representative sample of the waste for extractive analysis and to determine that the agent concentration is less than the Waste Control Limit (WCL).

In order to validate the ability to utilize headspace monitoring as a more appropriate method for determining safe levels for waste to be transported for off-site disposal, TOCDF conducted headspace monitoring tests. The tests were conducted using a clean matrix spiked with the least volatile agent (i.e., VX) to create an agent concentration on the matrix equivalent to the Waste Control Limit (WCL). The spiked matrix was then placed in a plastic bag. The bag was then monitored for agent using an Automatic Continuous Air Monitoring System (ACAMS). The agent monitoring results showed agent was not detected above the ACAMS limit of less then 1.0 Vapor Screening Limit (VSL), which is defined as the concentration above which presents a vapor hazard if that concentration is inhaled for longer than 15 minutes. Additional tests were conducted where a clean matrix was spiked with agent to create an agent concentration on the matrix equivalent to the dermal contact hazard limit (0.55 milligrams/70 kilograms body weight). The spiked matrix was placed into a plastic bag and agent monitoring of the bag's headspace was conducted. The agent concentration in the headspace during this test resulted in an ACAMS result that topped the high span value of the instrument. Similarly, HD and GB testing demonstrated that such matrices spiked at the WCL resulted in ACAMS readings above 1.0 VSL. Therefore, TOCDF is confident that using 1.0 VSL as a screening criterion, to determine wastes that have been sufficiently treated for off-site disposal at a permitted TSDF, is protective of human health and the environment.

TOCDF intends to characterize Autoclave treated secondary wastes as F999 or P999/F999 hazardous wastes based on post-treatment Autoclave headspace monitoring results. These

monitoring results are intended to provide the justification for allowing the off-site shipment of the wastes. The results are expected to show the treated secondary wastes do not have sufficient agent remaining on them to present an inhalation hazard (i.e., the agent monitoring result are less than 1.0 VSL) should the transport container be opened during transfer to an off-site TSDF. Further, if treated wastes have an Autoclave headspace monitoring result of less then 1.0 VSL then these same wastes also do not have sufficient agent remaining on them to present a contact hazard (i.e., a dermal hazard) should the transport container be opened during off-site transfer.

Demonstration of Compliance with the Requirement of the Subpart X Regulations

The Autoclave is a Subpart X Treatment unit. Operators who desire to permit Subpart X Treatment Units are required to evaluate the design of their process to ensure it is protective of human health and the environment. These requirements are found in 40 CFR 264.601, which specifies the requirements for operating a Subpart X Treatment Unit. The following table shows the methods TOCDF will use to prevent releases to the environment and to comply with the requirements for operating Subpart X Treatment Units.

Table 1 - Requirements of 40 CFR 264 Subpart X

Citation	Title	Compliance
40 CFR 264.601 Prevention of releases to (a) groundwater or subsurface environment	Environmental Performance Standards – Miscellaneous Units	Releases to groundwater or subsurface environment are prevented by: • Conducting Autoclave operation in an environmental enclosure (i.e., Igloo 1631) that has a sealed floor. • Providing secondary containment for the 90-day accumulation tank that will hold the condensate generated from Autoclave Operations
40 CFR 264.601 Prevention of releases to (b) surface waters wetlands, or on the soil surface	Environmental Performance Standards – Miscellaneous Units	Releases to the surface water, wetlands or soil surface are prevented by: • Conducting Autoclave operation in an environmental enclosure (i.e., Igloo 1631) that has a sealed floor. • Transporting waste to be treated to Igloo 1631 in sealed containers • Providing secondary containment for the 90-day accumulation tank that will hold the condensate generated from Autoclave Operations • Performing a post-treatment evacuation and air cooling/drying process steps to ensure treated wastes do not contain free liquids • Transferring treated waste to a roll-off in closed autoclave waste bin liners, or DOT-approved shipping containers • Ancillary equipment (i.e., piping and pumps) to the 90-day accumulation tanks runs inside the environmental enclosure that has a sealed floor
*40 CFR 264.601 Prevention of releases to the (c) air	Environmental Performance Standards – Miscellaneous	Releases to the air are prevented by: • Conducting Autoclave operation in an environmental enclosure (i.e., Igloo 1631) which vents to an induced flow activated carbon filter system.

Table 1 - Requirements of 40 CFR 264 Subpart X		
Citation	Title	Compliance
	Units	• Ducting air and water vapor removed from the Autoclave during the pre- and post- treatment evacuation process steps to the same activated carbon filter system. • Ducting the headspace of the 90-day accumulation tanks to same activate carbon filtration system. • Agent monitoring at the activated carbon filter system's mid-bed and exhaust stack. • Agent monitoring evaluation of the headspace of the sealed Autoclave prior to opening and removing treated waste.
40 CFR 264.15	General Inspection Requirements	The Autoclave, associated condensate piping, and Igloo 1631 floor will be added to the daily and weekly general Environmental Inspection regimen as specified in the RCRA Permit, Attachment 5.
40 CFR 264.33	Testing and Maintenance of Equipment – Preparedness and Prevention	The Autoclave will be installed in Igloo 1631, which is adjacent to the TOCDF-operated Igloos 1632 and 1633, both of which are currently incorporated into the TOCDF Permit as a hazardous waste storage unit. The current preparedness and prevention arrangement with DCD will continue as is spelled out in the RCRA Permit.
40 CFR 264.75	Biennial Reporting	Existing reporting requirements will continue to be complied with as specified in the RCRA Permit Modules I & II. Air emissions from the Autoclave located in Igloo 1631 are controlled by the same Carbon Absorption Filtration System used to control emissions from the Drum Ventilation Systems[1] (DVS) operated in Igloo 1632. Operation of the Autoclave result in the addition of 24-hour reportability for agent releases from the Igloo Carbon Adsorption Filtration System stack.
40 CFR 264.76	Un-manifested Waste Reporting	
40 CFR 264.77	Additional Reporting	
40 CFR 264.101	Corrective Action – Releases from SWMUs	Existing corrective action requirements will continue to be complied with as specified in the RCRA Permit Module VII.

***** Note, see Permit Modification Request TOCDF-DVS-02-1012 titled Area 10 Drum Ventilation System (DVS) for Secondary Waste for permitting activity associated with the activated carbon filtration system. This modification is undergoing concurrent public comment with the Autoclave Modification.

Format of the ADT

The ADT is formatted to establish "worst case" Operating Parameter Limits (OPLs); specifically minimum temperature, minimum time at temperature (i.e., heat-soak time), and maximum treatment batch volume based on the type of agent contaminating the wastes and the waste matrices selected as feedstock during the test.

Selection of VX Contaminated Secondary Waste and Waste Matrices for ADT Feedstock

VX contaminated secondary wastes are selected for use as feedstock for the ADT because VX is the most difficult agent to destroy and remove using Autoclave technology. Operating data generated during the ADT will be used to develop Operating Parameter Limits (OPLs) which will be applicable to secondary wastes that are contaminated with Agents GB and Mustard (H/HD/HT). Using VX contaminated secondary waste results in the development of OPLs which are based on "worst case" operations.

VX is determined to be the most difficult agent to treat by Autoclave technology based upon its vapor pressure and hydrolysis rate of reaction relative to the other agents.

Vapor pressure is considered because the Autoclave process involves the application of heat; the higher the temperature the higher the vapor pressure of a compound and the greater the evaporation rate. The Autoclave treatment process also involves the destruction of agent by hydrolysis. The hydrolysis rate of reaction also increases with increased temperatures. Additionally this reaction occurs more readily in the vapor phase. Therefore, a compound having a low vapor pressure and a slow hydrolysis rate of reaction will require higher temperatures and longer treatment times than compounds having higher vapor pressures and faster hydrolysis rates of reaction. OPLs that assure treatment of VX contaminated secondary waste will be conservative when those same OPLs are applied to the treatment of GB and Mustard contaminated secondary wastes.

Table 1 shows the vapor pressures and hydrolysis rates of reaction for Agent VX, GB and H/HD.

Table 1. Agent Vapor Pressures and Hydrolysis Reaction Rates

Agent	Vapor Pressure		Volatility		Hydrolysis Rate (Half Life)	Thermal Decomposition Rate (Half Life)
	(@ 0 ºC) (torr)	(@ 25 ºC) (torr)	(@ 0 ºC) (mg/m3)	(@ 25 ºC) (mg/m3)		
VX	**4.20E-05**	8.78E-04	0.662	12.6	**25ºC, pH = 7; 40 days**	**35 hours @ 150 ºC**
GB	0.41	2.48	3,370	18,700	25ºC, pH = 6; 47 hours	2.5 hours @ 150 ºC
HD		0.106		906	25ºC, pH = 7; 8.5 minutes	decomposes @ 149 - 177 ºC

Source: Provided in Section 4.3 of this permit modification

In addition to the worst-case demonstration created by processing VX contaminated secondary waste during the ADT, TOCDF intends to create a second tier worst-case demonstration during the ADT by processing a mix of secondary waste matrices during each of the three test runs.

The selected ADT secondary waste matrices are dunnage (comprised primarily of wood), Life

Support System (LSS) hoses, Demilitarization Protective Ensemble (DPE) Suits, and the High Density Polyethylene (HDPE) drums used to store the wastes. These waste matrices are selected to represent other types of waste matrices that are similar, with the intent being that a successful demonstration of Autoclave treatment on the selected matrix will preclude the need to perform a demonstration for a similar matrix. Table 5-1 of the ADT Plan provides the matrices selected for the ADT and the like-waste matrices the test matrices represent. Note agent contaminated activated carbon is a special case and TOCDF intends to perform a demonstration using carbon as a feedstock later when sample preparation and analytical methods are finalized.

Performance tests conducted to demonstrate compliance with incinerator emission standards require three separate test runs be conducted. The ADT will consist of three test runs. The processing of a mixture of matrices each run of ADT is desirable to minimize the total number of runs required for the test. To demonstrate each of the selected test matrices separately would require 12 runs.

The Autoclave is sized to hold up to four of the 64.7 ft^3 waste bins. The wastes are transferred to lined waste bins before being placed in the autoclave. Each waste bin will contain secondary wastes from the same waste stream (e.g., one waste bin will contain DPE Suits; one will contain LSS air hoses, etc.). A thermocouple lance will be inserted into the center of mass of each waste bin.

Unlike the TOCDF MPF, whose Primary Combustion Chamber is operated as a three separate zones, each with their own independent temperature and water spray controls, once the Autoclave chamber is at operating temperature and pressure, the interior environment throughout the vessel is homogenous in regards to temperature, pressure and moisture content. All the wastes inside the Autoclave are exposed to the same temperature for the same amount of time. The Autoclave OPL of minimum temperature and minimum time at temperature will be established for all the different waste matrices based on the time required to successfully treat the matrix tested during the ADT that takes the longest time and highest temperature. Since the Autoclave treatment environment is homogenous, and all the wastes inside are exposed to the same environment, there is no need to perform three runs for each waste matrices.

ADT Success Criteria

Two ADT success criteria are proposed; one to be developed from the agent spike that will be added to each waste bin during the ADT and the other based on the post-treatment Autoclave headspace agent monitoring results that will be conducted during the ADT and throughout Autoclave operations.

The first success criterion is that 99 percent of the agent initially spiked onto the agent-spiked swatches added to the waste bins during the ADT will be removed. The swatches will be made of the same matrix as the waste being treated and no larger than the amount of material that can be successfully digested during the sample preparation step. A known amount of agent will be spiked onto the swatch. The swatch will be placed within a mesh sachet, and the sachets buried in the waste filling each waste bin.

Selection of Regulated Autoclave Operating Parameters

Autoclaves treat contaminated material by exposing them to an elevated temperature for pre-set time periods. The three proposed Autoclave OPLs to be added to Module VIII of the TOCDF RCRA Permit are:

- The minimum waste load temperature as determined by the four thermocouple lances and demonstrated during the ADT. There are four waste load positions within the Autoclave; a thermocouple lance is placed into the center of mass of each waste load occupying each of the four waste load positions.

- The minimum heat-soak time (i.e., the time each waste load is required to be exposed to the minimum waste load temperature to ensure destruction of the agent) as demonstrated during the ADT.

- The maximum volume of each batch of waste to be treated as demonstrated during the ADT. The volume of the waste load – rather than the weight – is proposed as an OPL because variations in mass do not affect the effectiveness of the Autoclave treatment; i.e., the waste loads having different weights but the same volume will still be exposed to the same temperatures for the same period of process time; the process timer and thermocouple lances will ensure that these loads of various weights receive the same processing time because the temperature of each waste load must reach the process setpoint before the process timer begins to count down. The time it takes loads of waste to reach the process temperature setpoint will vary, with the heavier loads experiencing a longer "ramp-to-temperature" time then the lighter loads. The "ramp-to-temperature" time is part of the overall processing time.

In addition to the above OPLs two other conditions are proposed to ensure that steam contacts the wastes during the treatment process and that the wastes are treated as thoroughly as possible.

Most secondary wastes are stored in drum made of High Density Polyethylene (HTPE). To minimize material handling, TOCDF prefers to process the secondary wastes without removing them from their original storage containers because the weights of the storage containers indicate that there is sufficient void space in the containers to allow the steam to penetrate through the waste. However, there is some concern that steam, which is used to hydrolyze the agent contaminating the secondary waste, will not penetrate to the bottom of a container. Additionally, the melting point of the HTPE is about 50 ºF less than the temperature the Autoclave will be operated. So the HTPE drums will most likely melt and deform. To what extent they drums will deform from melting is currently unknown. To what extent the steam will penetrate into the wastes located at the bottom of a drum is also unknown. TOCDF intends to conduct some tests using HTPE drums and uncontaminated DPE Suit material placed in plastic bags to determine the viability of treating secondary wastes in the Autoclave in their original HDPE storage containers. If the testing shows that the wastes can be treated in the HDPE containers then it can be additionally assumed that there would be no issues with treating waste in metal container

since these containers will not deform and there is equivalent void space within the metal containers used to store secondary wastes.

The following conditions are proposed to address these issues.

- ***Secondary wastes stored in High Density Polyethylene (HDPE) containers shall be treated in the Autoclave by first transferring the wastes to waste bins. These wastes shall not be treated in their HDPE storage containers unless the Permittee provides information demonstrating the effectiveness of this treatment configuration.*** This condition will ensure that wastes are treated in the Autoclave in the configuration that is most effective for treatment and allow TOCDF the option to use a different waste configuration if it can be shown to be equally effective. The information obtained from the testing referenced above will be provided to DSHW before the beginning of the second Public Comment period that is associated with Class 3 Permit Modification Requests.

- ***The Autoclave process shall include a minimum of two evacuation steps, with each evacuation step followed by a heat-soak step.*** The first evacuation/heat soak step pair will melt the plastic bags the wastes are packaged in, thus exposing the waste to the steam inside the Autoclave and provide an initial phase of treatment. The second evacuation/heat-soak step pair will treat the exposed wastes.

These conditions are proposed to preclude the need to develop waste load configurations for the 1.5 million pounds of TOCDF generated secondary waste currently in storage.

A final set of permit conditions are proposed to ensure consistent waste management practices are applied to secondary wastes treated in the Autoclave as compared to secondary wastes that are currently transferred off-site after being decontaminated using processes other than the Autoclave; such as decontamination solutions.

Secondary wastes are currently being transferred to off-site Subtitle C TSDFs. The off-site management and containerization of the wastes is determined by agent monitoring results. If the agent monitoring results show agent concentrations in the headspace of the container, or enclosure, the wastes are monitored in are equal to or less then 0.2 VSL, the waste are managed in roll-offs for shipment to an off-site TSDF. If the headspace monitoring results show the agent concentration is greater than 0.2 VSL but less then 1.0 VSL, the wastes are transferred to the off-site TSDF in DOT approved sealed containers with special handling requirements imposed on the receiving off-site TSDF to directly landfill the containers without them being opened.

TOCDF is proposing to manage Autoclave treated wastes in the same manner. If the post-treatment Autoclave headspace agent monitoring results show an agent concentration of less than 0.2 VSL, then that batch of treated wastes may be transferred to a roll-off in anticipation of shipment to an off-site TSDF. If the post-treatment Autoclave headspace agent monitoring results show an agent concentration of greater than 0.2 VSL but less than 1.0 VSL, then the treated waste will be placed into Department of Transportation (DOT) containers. The sealed containers will be transferred to an off-site TSDF with special handling requirements imposed on the receiving off-site TSDF to directly landfill the containers without the them being opened.

TOCDF is proposing to add the following conditions that will control the management practices applicable to Autoclave treated secondary wastes:

- ***The Permittee shall perform post-treatment agent monitoring on the Autoclave headspace to determine the applicable waste management practices for the treated wastes.***

- ***Treated secondary wastes with post-treatment headspace agent monitoring results of less than 0.2 Vapor Screening Limit (VSL) may be managed in roll-offs for off-site transport.***

- ***Treated secondary wastes with post-treatment headspace agent monitoring results greater than 0.2 VSL but less than 1.0 VSL shall be managed in sealed DOT approved containers for off-site transport. The Permittee shall require the receiving off-site Treatment Storage and Disposal Facility to directly landfill the sealed container without them being opened.***

- ***Treated secondary wastes with post-treatment headspace agent monitoring results equal to or greater than 1.0 VSL shall be retreated in the Autoclave.***

Attachment 2 (Waste Analysis Plan) Changes

Revisions to the Waste Analysis Plan (WAP) were required to incorporate Autoclave treatment as a Treatment Technology Standard and for consistency.

Many of the secondary waste matrices that will be treated by the Autoclave are currently being treated by incineration through the MPF. Pending approval by the Executive Secretary of this permit modification request and the results of the ADT, those same waste matrices may be treated in either the Autoclave or the MPF. Current plans are to continue to treat Mustard contaminated secondary wastes in the MPF and to treat Agent GB and VX secondary wastes in the Autoclave. Revisions to the WAP incorporate the use of either the Autoclave or MPF.

Additional revisions were made to clarify the requirements associated with each treatment method by reference applicable sections in Module V (for MPF treatment) and Module VIII (Autoclave treatment).

IMPACT TO THE TOCDF

Environmental Impacts

Overall, Autoclave operations will have a positive environmental impact. A boiler with a capacity of approximately five million Btus per hour will support Autoclave operations. Secondary wastes treated in the Autoclave would previously have been treated in the Metal Parts Furnace (MPF), and Autoclave treatment of secondary waste will result in less consumption of natural gas while allowing for a greater throughput rate of waste as compared to MPF processing.

The use of the Autoclave, which essentially is a second treatment unit for secondary waste, will allow closure of the TOCDF in a shorter period of time. The sequential treatment of the DCD chemical agent stockpile, followed by the treatment of the inventory of secondary waste, was originally the accepted pathway to facility closure. With the commencement of Autoclave operations, destroying the DCD chemical stockpile and the treatment of secondary waste will occur concurrently, thus reducing the time to TOCDF closure.

The installation and use of the Autoclave addresses the fate of secondary waste. Autoclave operations provide assurance to the citizens of Utah that the U.S. Army has every intention of treating the inventory of secondary waste, which has been increasing in volume since TOCDF operations began in 1996, and does not intend to leave these wastes in storage after treatment of the DCD chemical stockpile is complete.

TOCDF Personnel Impacts

TOCDF will add personnel to manage the treatment of secondary waste using the Autoclave. Therefore, there will not be any impact to existing operations since there is currently sufficient staff to properly manage the demilitarization operations, and there will be the same number of staff responsible for the management of demilitarization operations once the Area 10 Autoclave operations are brought online.

Some of the personnel who currently respond to emergency and contingency events at TOCDF will be required to also respond to these same kinds of events should they occur in the Area 10 igloos managed by TOCDF (to include the Igloo 1631, which will house the Autoclave).

Physical TOCDF Impacts

The physical impacts to TOCDF of Autoclave installation and operations will be minimal. Autoclave operations will occur in Area 10. The igloo the Autoclave will be placed into currently exists and will require some renovation for this project, but any construction occurs away from the TOCDF itself.

The Autoclave to be used is commercially available; it is not a custom design. Therefore, systemization time is anticipated to be relatively short compared to a system that was of unique design.

3. PERMIT CHANGE PAGES

Change Pages in Permit Body

Module VIII: Pages 1 through 4, and 7

Module X: Page 5, 8, and 9

Permit Tables: Page 2

Change Pages in Permit Attachments

Attachment 1: Pages 5, 6, 8, 12, 13, 15, and 17
Attachment 2: Pages 3, 8, 11 through 15, 22, 24, 25, 32, 33, 34, 41, and 44
Attachment 4: Page 3
Attachment 5: Pages 4, 7, 13, and 39
Attachment 5: Inspection Logs: Pages D-24 and W-21
Attachment 6: Pages 3 and 28
Attachment 8: Pages 5 and 6
Attachment 9: Pages 8, 13, 14, and 112
Attachment 10: Pages 2, 5, and 7
Attachment 14: Cover Page and Pages 1, 2, 4, 5, and 45 through 53

NOTE: Attachment 9 shows both reline and bolded italic redline fonts. Redlined font is taken from TOCDF Permit Modification Request TOCDF-DVS-02-1012 titled "Area 10 Drum Ventilation System (DVS) for Secondary Waste". Bolded italic redlined font denotes changes associated with the Autoclave permit modification request. These permit modification request are undergoing concurrent review.

Changes to Permit Drawings

To be included as "As-Builts" upon completion of Facility Construction Certification

4. SUPPORTING INFORMATION

4.1 Autoclave Demonstration Test Plan

4.2 SwRI® Autoclave Test Report

4.3 Supporting Information Vapor Pressure and Hydrolysis Rates of Reaction

4.4 Igloo 1631 and Autoclave Drawings

Enclosure 4.1

Autoclave Demonstration Test Plan

Enclosure 4.2

SwRI® Autoclave Test Report

Enclosure 4.3

Supporting Information
Vapor Pressure and Hydrolysis Rates of Reaction

Enclosure 4.4

Igloo 1631 and Autoclave Drawings